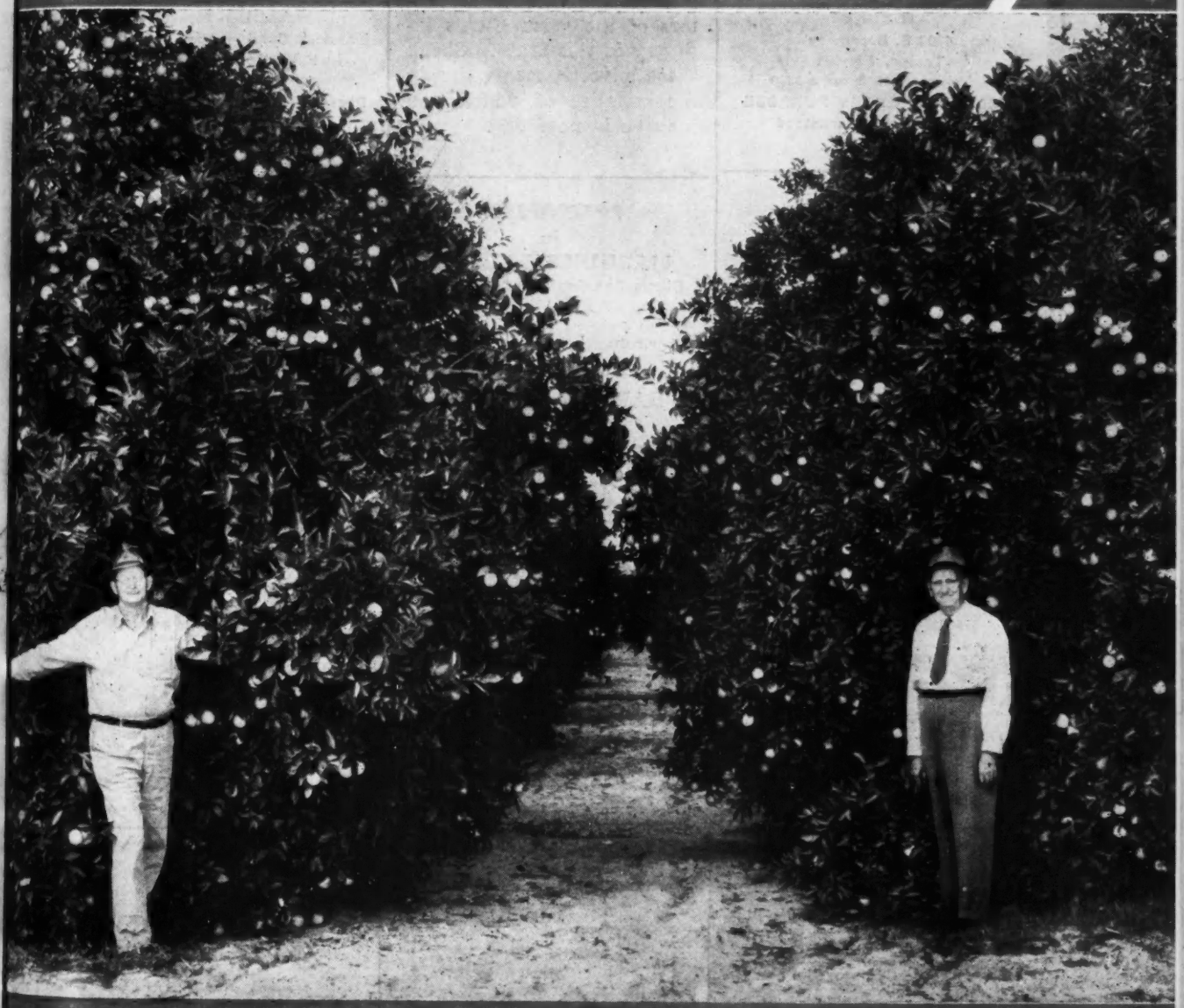
Citrus Industry

Representative of Every Interest
Representing No Special Interest

Subscription . . . . $1.00 Per Year
In Continental U. S.
$2.00 Per Year Outside



ITRUS GROVE SCENE
AL OF FLORIDA AT THIS
SEASON

This Month

Vol. 32, No. 12 Bartow, Florida December, 1951

CITRUS INDUSTRY BUYER'S GUIDE

Grouped together on this page are the advertisements of several Florida business concerns who are reputable suppliers of commodities of interest and value to all factors of the great Citrus Industry of this State. Check these advertisements closely for supplies of which you may be in need . . .

"The Original"
May Bros. Well Drilling Co.
"Born In The Business"
FARM AND GROVE IRRIGATION
Portable Equipment Enables Us To Give Prompt Service Within 200 Miles of Tampa
4200 E. Broadway
Tampa, Florida
Telephones 4-3560 and 8-3580
WELLS FOR EVERY PURPOSE
Our Work Is Guaranteed

ATTENTION GROWERS and Cattlemen
For More Economical Operation Contact
Farm & Ranch Supply Co.
Dealers For
MASSEY-HARRIS
Tractors, Combines and Implements
In Polk, Pasco and Hernando Counties
Phone 654 — 335 W. Main
Bartow

Lake Garfield Nurseries
P. O. Box 154
BARTOW FLORIDA
Citrus Trees Exclusively

SPECIALISTS in MACHINERY REPAIR
Citrus Canning and Concentrate Plant,
Citrus Packing House, Mine and Agricultural Machinery Repairs
"We Can Fix It"
BARTOW MACHINE WORKS
440 West Vine — Bartow, Florida
Phone 574

Complete
CITRUS GROVE MANAGEMENT
The Very Best of Service to Grove Owners of either Large or Small Groves
Servicing The Polk County Area
LOGAN and RICKBORN, INC.
(Formerly Clayton Logan, Inc.)
Lakeland, Florida
104½ S. Florida Ave. — Call 26-191

For
MAXIMUM CROPS
of
FINEST QUALITY
LYONIZE YOUR CROPS
LYONS FERTILIZER CO.
Tampa, Florida

STRUCTURAL STEEL
To Serve The Needs Of The Entire Citrus Industry
• Complete Fabrication and Erection Service
Southeastern Sales & Service
Structural Steel Division
Marion E. "Pat" Howell, Mgr.
W. C. "Bill" Spivey, Sales Mgr.
Phone 690 P. O. Box 751
Bartow, Florida

Hundreds of
Successful Florida Growers
Depend On Us For
Reliable Nursery Stock
GLEN ST. MARY NURSERIES COMPANY
Winter Haven, Florida

IRRIGATION EQUIPMENT
Pumps - Engines - Aluminum Pipe
Sprinkler Systems for Groves, Vegetables and Improved Pastures
Free Estimates
Shag Taylor Pump Co.
Wauchula, Florida
Phone 5471
Branch at Yalaha, Fla., Phone Leesburg 1119 Red

CITRUS PICKING LADDERS
..Constructed of red hear cypress with Tennessee White Oak rungs. We aim to carry a complete line of well seasoned picking ladders in various lengths at all times.
TERRY LADDER WORKS
BARTOW, FLORIDA
Phone 9-5581

We Are
PRINTING SPECIALISTS
On all forms required for keeping accurate grove operations records . . . And all other forms of booklet or special form printing, including Printed or Engraved Stationery.
Contact Us For Details And Prices
Bartow Printing Company
Phone 269
Bartow, Florida

Citrus Insect Control For December 1951

W. L. THOMPSON AND R. M. PRATT*
FLORIDA CITRUS EXPERIMENT STATION, LAKE ALFRED

The major pest control problem all during the fall months has been the control of red scale, because of the unusually severe late season build-up. The average infestation is now even higher than it was during July, and 71 percent of the groves being checked are infested. This is in spite of the fact that many growers have re-sprayed for red scale during the fall.

While purple scale populations have been increasing slowly, the peak of the fall hatch has been passed, and the infestations in general have not reached serious proportions. The average infestation is lower than it was a year ago and only a few groves have required fall spraying especially for purple scale.

Purple mite infestations are at a low level but some increase is to be expected during late November and December. Where spraying is required for scale or rust mites, DN should be included in the mixture if purple mites are present, and in some cases it will be necessary to spray especially for these mites.

Rust mites are also less abundant than a year ago, but December is a critical time with regard to rust mite injury since the benefits of a full season's spray program can be lost if a late infestation is allowed to russet the fruit. Also much damage to the foliage may result through greasy spot and through leaf drop due to direct injury to the leaves and twigs.

December is more or less at the crossroads of the year for scale control. Where medium scale infestation are present, the question arises as to whether to spray now or wait until later in the winter or even delay treating until the post-bloom period. This question is rather difficult to answer. Where light to medium infestations of either purple or red scale are present, it might be well to delay treating at this time. During the cool winter months the life cycle is longer than during warm weather, which results in a slower build-up of infestations during this period. Sometimes a high mortality of scale insects occurs during December and January. For these reasons it may be safe to delay spraying longer than it would be earlier in the season. If, at a later date, the scale infestation continues to increase then control measures should be taken. However, control is recommended where fruit drop is excessive because of a purple scale infestation. Before spraying where there is a heavy fruit drop, the stem ends of the fruits should be examined to determine whether the scales are causing the drop. Causes other than scales are often responsible for an abnormal fruit drop.

Where control is necessary it is recommended that 1 2/3 pounds of parathion and 5 pounds of wettable sulfur per 100 gallons be used. DN Dry Mix can be added to the parathion spray if purple mites are present. The parathion should be applied during calm weather when the temperature is 60 degrees or above. Oil emulsions will, of course, kill scale but from the standpoint of tree injury December is a dangerous month to apply oil. If freezing weather occurs any time during the winter the trees are more likely to be injured if they have been sprayed with oil. A December oil spray may also prevent a normal amount of bloom next year.

Rust mite infestations should be kept at a low level with sulfur sprays or dusts to prevent russeting of the fruit and "greasy spot" on the leaves. During the fall and winter months heavy rust mite infestations on the leaves and green twigs may be a factor in causing a heavy leaf drop during periods of windy and dry weather, even in the absence of greasy spot.

When checking for rust mites the leaves, as well as the fruit, should be examined. At this time of year the mites tend to build up more on the leaves; also it is very difficult to see them on colored fruit.

Since purple mites are generally on the increase, careful inspections should be made on the summer and fall growth of leaves and twigs. If mites appear to be scarce, the most likely places to find them are on exposed branches on the south sides of the trees and in the tree tops. Where it is necessary to control rust mites it is advisable to include DN Dry Mix in the sulfur spray or dust for the control of purple mites if any eggs or active mites are found. In groves where 15 to 20 percent of leaves or twigs are infested with purple mites, control measures should be taken even though no rust mites are found.

For more specific information consult the Florida Citrus Experiment Station at Lake Alfred or Fort Pierce.

*Written November 26. 1951. Reports of surveys by Harold Holtsberg, Cocoa; J. W. Davis, Tavares; K. G. Townsend, Tampa; J. B. Weeks, Avon Park; and E. D. Harris, Jr., Lake Alfred.

Alien Insect Enemies Boost America's Food Costs

C. E. COOLEY
SUPERVISOR OF CALIFORNIA AND PACIFIC ISLANDS AREA, DIVISION OF FOREIGN PLANT QUARANTINE, BUREAU OF ENTOMOLOGY AND PLANT QUARANTINE, U.S.D.A., IN CALIFORNIA CITROGRAPH

The foreign plant quarantines and restrictive orders of the Secretary of Agriculture are intended as a protection against the further introduction of destructive insect pests and plant diseases. These orders, of which there are now twenty-four pertaining to foreign importations and eight covering movements from our overseas territories of Hawaii and Puerto Rico, are both prohibitive and restrictive in nature.

The prohibitive quarantines apply to those plants or plant products known to be infested in the countries of origin by pests and diseases for which no satisfactory safeguard treatments are yet available, whereas the restrictive quarantines are applied generally to those plants or plant products subject to infestation by pests for which adequate safeguard measures are available.

Need for Quarantine Safeguards

Are these restrictions necessary? Does the protection afforded justify the public funds expended? Many of the insect pests causing the greatest losses to economic crops in the United States are of foreign origin, the cotton boll weevil, which reached us from Mexico, destroys as much as a half billion dollars' worth of cotton in years favorable to this pest. The European corn borer has been steadily increasing its "take" of the American corn crop. In 1949 it caused an estimated loss of almost three hundred million dollars. The Hessian fly, which arrived along with the Hessian troops Great Britain hired to oppose us in our battle for independence, stayed on and the losses caused to our wheat crop have amounted to as much as a hundred million dollars in a single year.

These are just a few of the destructive pests which migrated to our shores before controls were set up. Current losses to economic crops in this country from the ravages of insect pests are estimated at nearly four billion dollars a year, a large part of which is due to pests of foreign origin. While some of these pests would have gained a foothold in this country in spite of the laws and regula-

(Continued on page 13)

The Citrus Industry
EXCLUSIVE SPECIALIZED CITRUS PUBLICATION
Issued Monthly
Representative of every interest
Representing no special interest

Publication office at Bartow, Florida. Entered as second class matter February 16, 1920, at the post office at Tampa, Florida, under the act of March 3, 1879. Entered as second class matter June 19, 1933, at the post office at Bartow, Florida, under act of March 3, 1879.

Variations In Stem Pitting On Tristeza-Inoculated Plants Of Different Citrus Groups

THEODORE J. GRANT(1), A. S. COSTA(2), AND SILVIO MOREIRA(3)

AT MEETING FLORIDA STATE HORTICULTURAL SOCIETY

Introduction

The reported association of stem pitting symptoms with tristeza disease in Brazil, decline of grapefruit in South Africa and quick decline of sweet oranges in California affords additional evidence of the great similarity of these diseases (2, 5, 6, 8). The studies in Brazil of reactions of the grapefruits, limes, lemons and trifoliate hybrids to tristeza and the occurrence of stem pitting indicated the importance of hybrid plant reactions (5). To obtain further information it seemed desirable to record systematically the degree of pitting on the large number of tristeza-inoculated seedling and grafted plants at Campinas, Brazil (3). This paper describes the methods employed and discusses pitting in relation to the citrus groups studied.

METHODS

General field observations of trees naturally infected with the tristeza virus indicated that pits frequently occurred on stems at or below the point where the second or third from the last terminal flush of growth ended. Thus, on the young inoculated nursery plants, branches having three flushes of growth were selected and cut off, the bark was removed and the degree of pitting was rated numerically as follows: O, no pits; 1, very few scattered pits; and 2, 3, 4, and 5, increases in the frequency of pits from few to many. Field observations also indicated that on older trees, pits might be found on some branches and not on others. Thus, in making the detailed observations on the younger field plants when no pits or only questionable ones were found, additional branches were cut off and examined before a final rating was given.

Detailed data on the degree of pitting were obtained from examination of more than 2,000 citrus scions on a large number of different rootstocks, of tops of some 465 seedlings of many citrus varieties, and of the roots on 400 grafted plants and 170 seedlings. Study was also made of the roots and tops of approximately 200 potted plants that had been employed in various tristeza disease tests under screenhouse conditions. For convenience the data obtained have been combined (table 1) and the results are discussed by citrus groups.

OBSERVED REACTIONS BY CITRUS GROUPS

Mandarin Group

Examination of 196 Dancy tangerine tops on 52 different rootstocks showed that 98 percent of the tops had no pitting and 2 percent had a small amount. As the rootstocks represented a wide range in citrus types it would seem that rootstocks had not influenced the remarkably uniform reaction of the Dancy tangerine tops. Similar results were obtained from 104 seedling tops of 20 mandarin varieties; 99 percent had no pits, and 1 percent had a small number.

When 111 root pieces represent-

1. Pathologist, Bureau of Plant Industry, Soils, and Agricultural Engineering, United States Department of Agriculture, Orlando, Fla.
2. Pathologist, Instituto Agronomico do Estado de Sao Paulo, Campinas, Brazil; and collaborator, United States Department of Agriculture.
3. Head of Division of Horticulture, Instituto Agronomico de Estado de Sao Paulo, Campinas, Brazil.

ing 16 mandarin varieties employed as rootstocks for 4 different sweet orange and 2 grapefruit varieties were examined, it was found that 99 percent of the mandarin rootstocks had no pits and only 1 percent had a few. This lack of pits on the mandarin roots was obtained in spite of the fact that pitting was observed in many of the grapefruit tops. Of 56 seedling roots representing 10 mandarin varieties, 96 percent had no pits and 4 percent had a few.

The combined results from 300 tops and 167 roots of the mandarin group studied at Campinas show 98 percent with no pits and 2 percent with few (table 1). Thus, it would seem that the mandarins studied can be classified as having tissues tolerant to tristeza and no or little tendency to pit.

Sweet Orange Group

Observations on 777 Barao sweet orange tops on 120 different rootstocks, 265 Valencia orange (seedling origin) tops on 82 rootstocks, 108 Bahianinha navel orange tops on 22 rootstocks, 50 Florida Sweet Seedling orange tops on 11 rootstocks, and 52 tops of seedling plants of 12 sweet orange varieties showed that there were some difference among sweet orange varieties in the degree of pitting. For example, the most severe pitting occurred on the Florida Sweet Seedling tops; 2 percent of these had not pits and the percentages in classes 1 to 4 were 34, 18, 38 and 8. In contrast, 92 percent of the Valencia orange tops had no pits, 7 percent had degree 1 pitting, and 1 percent had degree 2.

A study of the data showed that in sweet orange scions on non-tolerant rootstocks the degree of pitting was lower than in similar scions on tolerant rootstocks. This may be due to the poor growth and difficulties in removal of bark from scions on non-tolerant rootstocks.

By study of the roots of 38 plants of 5 sweet orange varieties employed as rootstocks for 3 sweet orange and 2 grapefruit varieties, it was found that 87 percent of the rootstocks had no pits and 13 percent had few. Pitting in the grapefruit scions did not extend into the sweet orange rootstocks. Of 19 seedling roots of 4 sweet orange varieties 85 percent had no pits. 10 percent had degree 1 pitting, and 5 percent degree 2.

This study of 1252 sweet orange tops and of the roots of 57 plants shows that sweet oranges, although tolerant to tristeza, have tissues which sometimes react to form pits (table 1). This is of special interest, for in general sweet oranges on tolerant rootstocks do not show any recognized leaf symptoms of tristeza but the presence of the casual virus might be indicated by the occurrence of stem pits. In sweet oranges, this pitting cannot be seen until the bark is removed from the young branches. The observations suggest also that some varieties of sweet orange may be affected more than others. How much effect pitting may have on growth or production is not known. It is evident that the tristeza virus does have some deterimental effects, and it would be of interest to learn, as was previously pointed out (4), whether sweet orange tops infected with a mild tristeza virus strain when on tolerant rootstocks would grow and produce more or better fruit than comparable plants infected with the severe tristeza virus. From the currently observed differences in expression of pitting symptoms by sweet orange varieties it seems possible that the effects of a mild virus strain might be less harmful on some varieties than on others. It also follows that, although all sweet orange varieties may be considered relatively tolerant to the tristeza virus, over a period of years some varieties may prove to be more satisfactory as rootstocks than others.

Grapefruit Group

The examinations of plants in the grapefruit group may be summarized as follows: of 312 Duncan grapefruit tops on 82 different rootstocks 18 percent showed no pits, 54 percent had few pits (degrees 1 and 2), and 28 percent had many pits (degrees 3 to 5). Of 235 Leonardy grapefruit tops on 66 rootstocks 18 percent had no pits, 52 percent had few and 30 percent had many. Of 41 seedling grapefruit tops of 9 varieties, 27 percent had no pits, 25 percent had few, and 48 percent had many. Of 95 grapefruit plants of 5 varieties used as rootstocks for 3 sweet orange and 2 grapefruit varieties, 33 percent had no pits, 48 percent had few and 19 percent had many. Of 15 seedling grapefruit roots, of 5 varieties, 7 percent had no pits, 53 percent had few, and 40 percent had many.

tops and 110 roots of grapefruit show that, in comparison with sweet orange and mandarin, grapefruit

The combined results from 588 plants have relatively very sensitive tissues (table 1). This fact not only reconfirms the knowledge that grapefruit plants are non-tolerant to tristeza; but it may also help in understanding why, in tristeza infested areas, a gradual decline in grapefruit production may occur, as is the case in South Africa (7) and Argentina (9), even when the grapefruit trees are on tolerant rootstocks. The greater sensitivity of the grapefruit tissues is illustrated also by the fact that grapefruit scions may show distinct pitting symptoms even when their mandarin or sweet orange rootstocks have no or few pits. These observations emphasize the importance of differences in plant tissue reaction to the tristeza virus or its by-products.

Pummelo Group

Of 40 seedling pummelo tops of 9 varieteis 45 percent had no pits, 38 percent had few, and 17 percent had many. Of the roots of 30 seedling pummelo plants of 7 varieties 60 percent had no pits, 23 percent had few, and 17 percent had many. Of 97 pummelos of 12 varieties being used as rootstocks for 3 sweet oranges and 2 grapefruits 61 percent had no pits, 19 percent had a few, and 20 percent had many.

In most of the work at Campinas the unit number in any given test was 5 plants whether as a rootstock, a scion or a seedling. It was frequently noted that 1 or 2 pummelo plants in a group of 5 might be badly pitted and the others might have few or no pits. Possibly this reaction may be related to the fact that the pummelos as a whole are considered to be monoembryonic. Thus, the seedling plants are gametic in origin and the differences in reactions may be related to their heterozygous nature.

By combining the 40 observations on pummelo tops and those on 127 pummelo plant roots, it can be seen that the degree or frequency of pitting on the pummelo plants was not as great as on the grapefruit plants but was much greater on the pummelo than on the sweet orange and mandarin plants studied. (table 1).

Tangelo Group

The combined results for 122

tangelo tops of 27 varieties and for the root growth from 145 tangelo plants of 13 varieties show that pitting was somewhat more than in the mandarin group but very much less than in the grapefruit group (table 1). Inasmuch as tangelos are hybrids it is of interest that the observed reactions were closer to those of the mandarin parent than to those of the grapefruit parent.

Trifoliate Orange and Hybrid Group

The material in the trifoliate orange and hybrid group was somewhat limited (table 1). It is of interest, however, that none of the 20 trifoliate orange tops, the 15 citrumelo tops, or the 28 citrumelos used as rootstocks showed any definite pits. In contrast definite pitting was found on some of the 24 citrange seedling tops, and on some of the 13 seedling citrangequat plants. The data limitations do not permit adequate comparison of varieties but that there are distinct differences in reactions of different hybrids is certainly clear.

Lemon Group

Of the 163 Eureka lemon tops, 98 percent had no pits and 2 percent had a few (table 1). In contrast, Kulu lemon seedlings were badly pitted. Limited observations on the seedlings of 7 different varieties indicated that in a seedling population of lemons one might find some plants with few or no pits and others that are badly pitted. These observations also indicate that important differences may occur between varieties of a single group and also between plants in a seedling population, especially when such plants may be of gametic rather than nucellar origin.

Lime Group

Observations on 93 plants of 4 West Indian lime varieties showed that pitting occurred on both tops and roots. The combined data show that only 9 percent of the plants had no pits and that the majority had many (table 1). The positive reactions of the West Indian limes to tristeza make them particularly valuable at test plants, as has previously been noted (2, 5, 6, 8).

Sour Orange Group (Including Bittersweet varieties)

Of 65 seedling sour orange tops representing 14 varieties 99 percent had no pitting and 1 plant was badly pitted. None of the roots of 62 sour orange plants representing 14 varieties were pitted. Of the roots of 83 plants of 6 sour orange varieties being used as rootstocks for 3 sweet orange and 2 grapefruit varieties, 99 percent had no pits and 1 percent had a very few small pits.

Summary of the 210 observations shows that 99 percent of the sour orange plants had no pits. 0.5 percent had few pits, and 0.5 percent had many (table 1). The two plants which appear to be exceptional in respect to pitting could very well be of gametic rather than nucellar origin.

Additional observations on sprouts from 20 sour orange rootstocks which had tristeza-diseased sweet orange tops showed that none of these sprouts had any pitting.

The lack of pits in the sour orange group would appear to be related to the reactions of sour orange previously described (1), namely that sour orange is difficult to infect by means or aphid inoculations and it appears to have a physiological resistance to tristeza that tends to limit virus multiplication and distribution.

DISCUSSION

When Oberholzer et al. (7) first reported stem pitting on grapefruit varieties, they also noted the occurrence of similar pitting on a few trees of Valencia and Bailidge Early orange and on shaddock trees. Since that time, similar symptoms have been reported on certain varieties of limes, lemons, grapefruits, and sweet oranges (2, 5, 6). Also some differences have been noted with respect to size of the pits and the coloration associated with the pits. McClean (6) reported, "they differ in colour from the normal surrounding wood: in young branches they may have a greenish, glassy appearance or may be a light orange or brown colour in the larger branches or trunk." In Brazil, the authors have noted that in one lot of five seedlings of the hybrid Poormans Orange one plant had large definite pits such as frequently found on grapefruit while another plant had a very large number of pinpoint pits. They also observed at the Limeira Citrus Experiment Station a red coloration in the pits occurring on a seedling tree resulting from a cross between a grapefruit and a pummelo. A cross section of the stems of this tree showed scattered red lines in the wood, indicating that the stem had been repeatedly pitted but that it had been able to maintain a more or less normal outer appearance. There were also indications that the pits when first formed did not always have the associated red coloration.

These instances are given in order to point out the need for further work and the limitations of our present knowledge.

The data presented in this paper, although they indicate certain trends such as the general lack of pitting in the mandarin group, do not necessarily mean that some mandarins or tangerines will not be found that will show pitting. The data, however, do indicate that when a pitted mandarin is found it would be well to consider the possibility that it is of hybrid origin.

The association of pitting symptoms with tristeza in Brazil, grapefruit decline in South Africa, and quick decline in California is helpful and provides opportunities for comparions of studies in different

---

1. **Footnote by T. J. Grant**

Since the preparation of this manuscript L. G. Knoor, E. P. Ducharme, and H. Banfi published (Citrus Magazine October, 1951) an article, "The occurrence and effects of 'stem pitting' in Argentine grapefruit groves." Their observation of extensive occurrence of stem pitting on a mandarin, the so-called Improved mandarin, and on Rough lemon do not coincide with the observed reactions of plants inoculated with tristeza by means of viruliferous aphids in the tests at Campinas, Brazil. These differences in observations suggest that pitting of the so-called Improved mandarin might be a hybrid reaction to tristeza or that they may be dealing with a specific virus strain or an additional disease such as concave gum, blind pocket psorosis, xyloporosis or cachexia. Their report is based on field observations as they state, "In the absences of transmission tests we are not in a position to comment on the casual nature of Argentina's stem pitting."

It is of some interest also, that field observations in the Citrus Experiment Station plantings at Limeira in Brazil indicated (2) that the Foster grapefruit was more severely pitted than was the Marsh seedless grapefruit in adjoining plantings. This does not agree with the greater severity of pitting on Marsh grapefruit observed in South Africa and Argentina. The investigations in Brazil have pointed out the existence of tristeza virus trains. It is to be expected that virus strain differences may be related to differences in the presence and degree of stem pitting symptoms. The current report emphasizes the important differences in tissue reactions that may be related to minor differences in hybrid plant response to the tristeza virus. The terms Rough lemon, sweet lime are indeed extremely general and within each there may eventually be found appreciable differences in tissue reactions.

The exchange of virus material within disease infected areas may not be advisable but exchange of citrus seed from controlled sources for use in controlled comparative tests would seem to be highly desirable to eliminate as far as possible one of the variable factors in comparison of plant variety reactions to a specific source of virus.

(Continued on page 15)

The Program Of Certification Of Citrus Budwood

CARL WAIBEL
TEXAS DEPT. OF AGRICULTURE
At MEETING FLORIDA STATE
HORTICULTURAL SOCIETY

Psorosis, or "scaly bark" as most people know it, is a deadly virus disease that causes small fruit sizes and short life of many citrus trees. It is believed to have originated in the Orient and has been distributed to other citrus growing countries with the spread of citrus varieties and species. It first appeared in Florida after the freeze of 1894 in the orchards rebudded with budwod sent from California.

Psorosis should not be confused with another different disease, Leprosis, known to Florida growers as "scaly bark" or "nailhead rust". To avoid confusion, the name psorosis is used instead of "scaly bark". Psorosis has caused heavy losses in California, Texas and Florida. To date corrective measures have been taken in California and Texas but not in Florida. Unlike quick decline and other fast killers, psorosis is a slow killer and losses occur gradually over a long period of time. Over a period of years this disease causes staggering losses, not only to the grower, but to the entire citrus industry.

There are five related strains or varieties of this virus disease: psorosis — A, psorosis — B, concave, blind pocket and crinkly leaf. To date all strains have been found in California and all but crinkly leaf in Texas and Florida.

It is fortunate that there are no known insect vectors of this disease and that it is not transmissable by seed. Psorosis cannot be transmitted from diseased trees to healthy trees by pruning or other cultural practices. There is no known cure for psorosis. Expensive treatments have been tried but none have cured the disease. The only known means of transmission of this disease is by graft unions, either by budding or by natural root grafts. The only control of psorosis lies in prevention. Infested trees are produced in the nursery when they are grown from diseased trees.

Dr. H. S. Fawcett clearly demonstrated the virus nature of this disease in 1932 and a short time later discovered a leaf symptom associated with psorosis. This leaf symptom occurs in young and old trees and is the only means to detect a psorosis infested tree when it shows no bark symptoms. Realizing the tremendous importance of this means of identification, the nurserymen and the State Department of Agriculture, with the aid of Dr. Fawcett, set up a program for the registration of psorosis-free trees in California.

In 1946 three members of the Lower Rio Grande Valley Horticultural Club of Texas made a trip to California to study the registration program there. Their report aroused the interest of the Texas grower and nurserymen. Speakers from California were invited to the Citrus Institute, held each year in the Valley, to discuss the advantages and the need for such a program in Texas.

In 1948 Dr. Fawcett, at the invitation of the Lower Rio Grande Valley Horticultural Club, made a study of psorosis in Texas and drew up a program for its control. In setting up this program Dr. Fawcett guarded us against some of the troubles California had experienced. He suggested some improvements over California methods, which have proved their worth. Through the cooperation of the Lower Rio Grande Valley Nurserymen's Association, the Lower Rio Grande Valley Experiment Station and the Texas State Department of Agriculture, that program is now being carried out.

The Texas program calls for the inspection of trees for psorosis and other bud-transmissable diseases. Those trees which are free of disease are registered as a source of budwood for propagation of citrus trees which are certified by the state to be psorosis free. Only licensed nurserymen are eligible to make application. The nurseryman is limited to the registration of six parent trees of each variety and a total of twenty-four parent trees in all. The parent tree up for registration must be at least eight years old. Its parentage must be traced and as much information as possible be obtained as to variety, production, and quality of fruit. The tree is then examined from top to bottom for bark lesions of psorosis and other diseases. It is then checked for bud mutations and sports, and finally the tender flush of new leaves is inspected from at least ten locations about the tree for leaf symptoms of psorosis. If the tree still shows no indication of psorosis or other diseases, the adjacent trees within thirty-five feet are examined in the same manner. If these trees show no symptoms of disease, they are then charted and the candidate tree is listed for possible registration. The charted trees are then inspected for leaf symptoms of psorosis in all flushes of growth for the entire year plus an extra inspection during a second spring flush. At the first sign of leaf or bark symptoms of psorosis on the candidate tree or a tree adjacent to it, the candidate tree is dropped from the program. If the candidate tree and the trees adjacent to it pass these tests, budwood is then taken from the candidate tree and budded on four Sour Orange and four Cleopatra seedlings in a test plot, where frequent inspections are made for leaf symptoms in all seasonal flushes as well as two spring flushes. If it passes this test it is then registered for three years and is subject to continued inspection.

Each parent tree is given an application number, as well as a tree and row number. The cutting of registered budwood is witnessed by the inspector or his deputy. Records are kept as to the number of buds cut from each registered tree. The budwood is bundled according to application, tree and row number and after budding each row in the nursery is labeled accordingly. A chart of the nursery is then filed with the inspector. These nurseries are inspected often. When the tree is ready for sale, a state seal is placed on the tree in the nursery row by the inspec-

tor, stating it is a state certified nursery tree.

The number of buds from a registered parent tree can be increased tremendously by the registration of a scion grove. The trees, propagated from registered trees, are inspected for four years and if found free of disease become registered parent trees.

The registration program in California has been very successful. In the early stages of the program, nurseries advertised as growers of state registered stock. Today it is no longer necessary, since the public now demand this disease-free stock. The state registered stock is selling for $3.00 per tree, while the grower of straight run stock is unable to dispose of it at $1.00 per tree.

In Texas the program has progressed rapidly. At the start 18 nurseries took part in the growing of certified trees. Today there are 32. The greatest problem today is to meet the demand. The freeze of '49 and '51 have been setbacks, but have opened the purchaser's eyes to the fact that often diseased trees were killed while healthy trees survived. With the limited supply of budwood available from these registered parent trees the supply of state certified nursery trees is far short of the demand created.

Florida is indeed fortunate in having able and well qualified technical men and administrators who recognize the importance of this problem. These men have led the way and have pointed out the need for such a program here in Florida, and what it could do for your citrus industry.

The main goal in Texas was to eliminate psorosis, but this program is leading to trees free of other bud-transmitted diseases, higher quality nursery stock, better quality fruit, better production, standardization of varieties and has placed the nursery business on the grown to order basis.

This program is slow and expensive in Texas and California, because no step can be omitted and there are no short cuts. A parent tree must pass all the steps before it can be registered. It is a tremendous task to select a tree for registration and it taxes the skill of a technician to determine that a citrus tree does not have psorosis, and it takes time.

A registration program has several potential advantages to a nurseryman. First, the nurseryman can take great pride in producing superior trees, known to be free of psorosis. Psorosis is a more dangerous pest than scale or insect pests, which can be controlled by the nurseryman or grower. Second, the nurseryman would provide better trees for the grower, and fewer losses would be expected when the trees are mature. A grower better satisfied with his purchases is more likely to tell other growers, this word of mouth advertising is often more effective than paid advertising. Third, a somewhat higher return per tree will compensate the nurseryman for the increased costs and records in obtaining such budwood. In Texas the costs of producing certified nursery trees are not more than 25 cents per tree above straight run trees, while the premium for such certified trees is 50 to 75 cents per tree. Most of the practices called for in this program are already standard practices of the more conscientious nurserymen. Fourth, the nurseryman engaged in the registration program has a competitive advantage over those with just straight run stock, since the nurseryman has a superior product. Such a program would tend to be an advantage to progressive nurserymen who plan to stay in business since the registration program is not adapted to fly-by-night or back-yard operators. Fifth, this program has also improved straight run nursery stock. Many Texas nurserymen have been surprised at the number of psorosis-infected trees previously used as budwood sources. Such infection varied from 4% to 100% in over 60 nurseries inspected. Only one nursery, propagating only one variety, was 100% free of psorosis. Many psorosis-free trees, adjacent to registered parent trees, are also a source of clean budwood for straight-run stock. Sixth, through the careful practices encouraged by this program, dangers from mix-up of varieties are reduced.

The big question in the nurseryman's mind is "will the grower pay the additonal cost of certified stock?". The answer is "yes". This has already been proven in both California and Texas.

The advantages to the grower are more obivous. For a higher initial cost per tree he obtains assurance that psorosis will not weaken or kill his trees at an age when the tree should be most productive. Thie means maximum production per acre, since there are fewer skips or weak trees. It means economies in fertilizer and replacement costs. Therefore, a higher intitial cost of trees is repaid by higher returns. It is more economical to pay a little more for a disease-free tree at the nursery, rather than pay many times that amount nursing an unproductive sick tree.

The grower who hopes to derive benefits from a registration program must create the demand for such trees, and the progressive nurseryman will be ready and able to supply that demand. Both California and Texas have learned

(Continued on Page 18)

The Economy Of Adequate Drainage For Citrus In Florida Coastal Areas

T. W. YOUNG, PRODUCTION MGR.,
AMERICAN FRUIT GROWERS,
(Formerly With Citrus Exp. Station)

AT MEETING FLORIDA STATE HORTICULTURAL SOCIETY

The soils of the coastal areas planted to citrus are for the most part inherently poorly drained. Planting is occasionally on mounds but usually on beds which provide broad furrows between the rows leading into ditches and canals for drainage. In general drainage is considered to be satisfactory and in some section they feel they are overdrained. There are few groves, however, in these low-lying areas that do not show at least some damage from flood waters or prolonged irrigation water in the middles. In fact within the past decade more trees have been killed or rendered unprofitable because of reduced yields in coastal groves through water damage alone than by all other causes combined. The appearance and yield from these groves should be ample proof of the need of better drainage. Nevertheless, those who feel a higher water table would provide better moisture conditions and help alleviate their troubles in time of drought are by no means a small minority. It is the purpose of this paper to point out the error in thinking of those that feel the present drainage is ample or those that advocate less drainage for these low-lying groves as well as to show the economy in improving the present drainage.

Production costs are high as compared to the state as a whole, primarily because of lower yields. But the high costs are contributed to by the nature of the lay-out of the groves. The use of some modern equipment is frequently difficult or impractical. At best the operation of all grove equipment is slowed down. Large amounts of hand labor are necessary. The desirability, and perhaps the essentiality, of reducing the cost of growing a box of fruit needs no discussion. In the face of increasing labor, materials, and equipment costs there is little opportunity for reducing the operating costs per acre. The greatest opportunity, and probably the only practical one, for economy in production in these areas lies in increased yields which can be attained through improved drainage.

A study by the Citrus Experiment Station of the rooting habits of citrus growing on several of the better East Coast soils under present average drainage showed that the principal root zone was confined to about the top foot of soil. Only occasionally did roots extend below the 2-foot level. It was found from water table wells on the bed crown in several of these soils that during excessively wet periods the soil in about the lower half of the root zone was saturated long enough to damage or kill citrus roots even though the surface water had drained from the furrows. The flooding of the middles with irrigation water for prolonged periods has also resulted in much damage. The course of events in the life of a tree under these conditions is about as follows: During seasons of normal rainfall abundant top growth is generally made, more or less at the expense of root growth. If this is followed by drought the relatively small root system cannot support the top and there will be a loss of foliage, fruit and some wood. But on such soils trees usually suffer more from flooding than directly from drought. When the soil becomes waterlogged the trees are apt to exhibit all the symptoms of drought. They are, in fact, suffering from physiological drought because the soil is poorly aerated and under these conditions the roots do not function properly in the intake of water or nutrients. Roots will be killed if this condition is prolonged and the ratio of top to roots becomes even greater. Later it is not unusual to find the tree wilting with favorable soil moisture. Under drought with a greatly reduced root system the dying back of shoots often results in a top somewhat smaller than it was a few years previously. A few cycles of this sort and the roots may become diseased and tree decline results. It is at about this point the desperate grower calls in the scientific workers and is disappointed because they cannot recommend some easy remedy like a spray or a unique fertilizer.

The economy of adequate drainage extends through all phases of citrus grove operation from planting to picking. It is difficult to divorce any one operation from the drainage problem in these low groves. Trees growing on well drained soils are more wind-firm because of deeper rooting. The grower is put to less expense resetting and replacing uprooted trees after wind storms. It is becoming an advantage to have soils well enough drained to use rootstocks less tolerant to "wet feet" than sour orange because of the possibility of tristeza or other virus diseases affecting certain rootstock-scion combinations being introduced. The greater economy obtained from fertilizers applied to deep rooted trees is common knowledge.

The greatest economy derived from adequate drainage, and the one that will automatically include all other economies, is that a larger soil reservoir of moisture is made available to the tree by allowing deeper rooting. The soil mass in which the tree is rooted, assuming good distribution of roots throughout, determines in a general way the amount of water available to the tree. For a given soil it is apparent that the deeper root distribution is obtained the greater will be the moisture supply to the tree for each unit of area. In the culture of fruit trees it is axiomatic that they be grown on deep, adequately drained yet moist soil where they can root deep if they are to attain and remain at their maximum producing capacity for the greatest number of years. The texture of the soil in most coastal groves is suitable for citrus root growth to a depth of 4 or 5

feet below the bed crown and drainage to permit permanent rooting to this depth in these heavy soils would be adequate. It is true that many groves not measuring up to these requirements have been profitable in the past, but the competition is increasing.

Some idea of the magnitude of the benefits of drainage to allow rooting to greater depths can be obtained by a consideration of some of the lightest to the heaviest textured soils on which citrus is grown in Florida and included most of the soil series to which citrus is planted in the coastal areas. The point can best be illustrated by examining the soil moisture data for a typical one of these soils, a Sunniland fine sandy loam. This is a palmetto flatwoods soil series which in recent years has been extensively planted to citrus after having been farmed to tomatoes or other truck crops. With the water table at 3 feet, which would allow ample aeration for rooting to a depth of about 2 feet; with normal seasonal fluctuations in the water table, it was found that the root zone would hold 5.19 acre inches of water when thoroughly wetted and allowed to drain to equilibrium (field capacity). Growing plants well rooted in this mass of soil would wilt and remain so overnight when the soil moisture was reduced to about 2.57 acre inches per acre 2-feet (wilting range) by transpiration and evaporation. Evaporation is effective in only the top few inches of soil and for the sake of this argument we can assume that it amounted to half that in the surface 6 inches, or 0.61 acre inch. Thus if plants were extremely well rooted in this soil they would have access to about 2.00 acre inches of water per acre 2 feet. In the field they probably would not be rooted well enough to extract more than 75 percent or about 1.50 acre inches. If we assume that the average size citrus trees under average weather conditions requires about 30 gallons of water a day this would supply water for an acre with 65 trees for about 21 days. Now let us consider this same soil under these same conditions except that the water table is lowered to 4 feet so as to allow rooting to a depth of 3 feet. When wetted and allowed to drain to equilibrium with the water table at 4 feet the surface 2 feet of soil was found to retain only 4.59 acre inches because of better drainage. Because of better drainage, however, rooting is possible an additional foot in depth. This foot contained 3.11 acre inches, making a total of 7.70 acre inches in the acre 3 feet. Wilting occurred at about 3.64 acre inches. Allowing for evaporation from the surface 6 inches as above and rooting in the field sufficient to extract 75 per cent of the water from the top 3 feet, it is found that 2.61 acre inches of water can be extracted before the trees wilt. This would supply the acre of 65 trees for about 36 days, a gain of about 75 percent.

Two of the 20 soils examined did not have friable soil to a depth of 3 feet and in these a decrease in available moisture in the possible root zone resulted from the deeper drainage because the slightly reduced moisture in the surface 2 feet could not be compensated for by deeper rooting. The average for the 20, however, of drainage to 4 rather than 3 feet was an increase of 1.37 acre inches, or 56 percent. This would likely be enough water to carry trees about 2 weeks longer, which in many, if not most, cases would eliminate the necessity of irrigation before rain fell. Here is a chance for economy worthy of consideration. Deeper rooting would reduce the need of supplemental irrigation to the point where it is doubtful if expensive irrigation equipment would be needed frequently enough to justify its purchase.

Fruit from the coastal areas is primarily for the fresh fruit trade where small sizes are not desirable. It is a common complaint that older trees on the very heavy soils frequently produce small sizes. Percolation of water through such soils is slow and drainage usually not sufficient. As discussed earlier, this often results in a low ratio of roots to top and a water deficit readily develops during drought. The leaves compete successfully with the fruit for moisture and without sufficient moisture to give them turgor the fruits cannot grow. This is sometimes the case even though there are no signs of wilting. The condition is aggravated by the fact that once these heavy soils have dried out rather thoroughly it takes considerably larger quantities of rainfall or irrigation to wet them to the

point where they will supply water to the tree than is the case on lighter soils. For example, assume a tree growing on a gumbo soil (Manatee f. s. l.) is rooted to a depth of 2 feet and that during drought the top 6 inches of soil is reduced by evaporation to near air dryness with the remainder of the soil in the root zone dried to the wilting range through transpiration. According to the moisture retention studies an inch of rain would be little more than sufficient to raise the surface 6 inches above the wilting level. Two inches would wet to field capacity to a depth of 8 inches, 5 inches to a depth of 15 inches, 4 inches to a depth of 21 inches and 5 inches would bring the entire root zone to field capacity with about 0.42 of an inch passing on into the soil below. In contrast consider the data for a light sand. Under the same conditions of dryness the first inch of rain would wet the sand to field capacity to a depth of about 17 inches. Two inches would bring the soil of the entire root zone to field capacity with 0.21 of an inch passing on to lower layers. The wetting of a soil under field conditions is probably not this simple and the moisture retention data are not absolute, but only approximations. They are, however, relatively corect and therefore comparable. The pertinent thing in this particular instance is that sometimes during drought showers may come which will do considerable good on light soils while not even raising the moisture content of heavy soils above the wilting point. It is obvious that in order for trees to benefit from the ability of the heavier soils to retain 2 or 3 times more available water than light soils it must be supplied in proportionately greater amounts. And the converse, in irrigation it would be poor practice to apply as much water on the light soils as would be required to bring the heavy soils to field capacity to a given depth since over half of it would percolate below the root zone. In either soil type rooting to greater depths than 2 feet would be economical.

Data of this sort are really not necessary, however, to establish the value of adequate drainage for citrus. One has only to go into almost any grove on the coast in order to observe the better condition of trees on the higher spots. There are exceptions, of course, when factors other than moisture such as soil, insects, disease or rootstocks are not comparable, but more often than not the trees with adequate drainage will be thriftier, larger, and yield appreciable more fruit than those on the poorly drained areas. There are many sour orange rooted groves on the well drained soils of the interior that lend additional weight to the argument for adequate drainage. Even on these lighter soils their production is substantially greater on the average for trees of equal age than on the coast.

The grower on the coast cannot elevate his land in order to secure better drainage. He must drop his water table. Note that this responsibility is placed on the individual here. It is neither practical nor desirable to lower the water table throughout these areas. Pastures and truck farming require a relatively high water table. With the drainage set-up on the individual grove as it should be there is nothing incompatible with the idea of placing water control structures in many of the drainage canals in the various drainage districts to hold back large volumes of water for use in times of drought. It is assumed of course, that these will be properly handled and in times of flood the water released so as to make room for the discharge from groves and other agricultural lands. If properly handled they will be a great asset to the area served. The flow of artesian wells, upon which many of the citrus growers and farmers in the various sections depend for irrigation, in some cases becomes so weak that irrigation cannot be carried out rapidly enough. Then some wells have already become too salty to be safe for irrigation. There is the possibility that this trouble will increase. On the other hand, growers that have been accustomed to turning their wells on and letting them keep their ditches full for long periods for sub-irrigation will need be more cautious if their main drainage canals are filled. As long as the main drainage canals are at a low level most of the water going into the grove ditches goes down and out into the main canals. Little of it moves laterally although sometimes low areas in such groves show the results of too much water. With the canals in the immediate vicinity at a high level subdrainage from the groves will be reduced. Water turned into a grove could easily build up to a level that would damage the lower roots extensively before it was noticed.

It is not within the scope of this paper to enter into a discussion of the ways and means of securing adequate drainage. It will call for deeper ditches in practically all groves with ditches more closely spaced in many. More pumping equipment will be needed. Water table wells in critical locations would be of benefit as a guage to drainage. Considerable improvement is economically feasible in most of these groves, but each grove is an individual problem. Adequate drainage will cost effort and money but only a fraction of the value of the trees that may be damaged without it. It is cheap insurance and the only insurance against water damage. Trying to increase production through heavier fertilization or any practice without first securing deeper rooting is to a great extent false economy. Any money spent on these groves will be better spent with adequate drainage and money cannot be spent to a better advantage than to secure it. This is the one big opportunity for these growers to increase production which will pay high dividends and allow them to continue to prosper in a highly competitive field.

SUWANNEE TO HAVE MORE GOOD GRAZING IN WINTER SEASON

Live Oak, Fla. — Suwannee county farmers will have more grazing for their stock during the next few months than they had last winter, County Agent Floyd Eubanks reports.

Several farmers planted clover on flatwoods land for the first time a few weeks ago and now have good stands of Louisiana white, England red, and Hubam clovers. Mr. Eubanks estimates that more than 500 acres have been planted to clover. Other farmers have top-seeded vetch in Pensacola Bahia grass pastures, and some have managed their permanent pastures so they have "reserve" areas for early winter grazing.

In cooperation with the county agent and Agronomist George E. Ritchey of the Suwannee Valley Experiment Station, farmers have established demonstration plots for testing various clovers and fertilizer treatments.

ALIEN INSECT ENEMIES BOOST AMERICA'S FOOD COSTS

(Continued from page 4)

tory activities, each year their establishment could have been delayed would have lessened our cost of living by several millions of dollars. In view of these experiences, could there be any reasonable doubt that some sanitary controls over foreign imports of agricultural products are necessary? Possibly we have been meeting the problem too late with too little.

Whether the protection afforded by Federal quarantine safeguards justifies the cost of enforcement can be found by simple calculation. Compare the estimated annual loss in dollars caused by any one of the above-mentioned introduced insects with the current annual cost of enforcing Federal import restrictions against plant pests (approximately two million dollars) and you will observe that the annual "board bill" of even one insect is many times greater than the cost of the entire Federal quarantine safeguard program. In fact the annual loss now caused by just one of the more important introduced pests, such as the European corn borer, is greater than the total amount of public funds expended by the Federal Government for quarantine protection against all foreign crop pests since the passage of the Plant Quarantine Act in 1912.

The direct effect of these alien crop pests on the people of the United States is to increase the cost of the food, clothing, and shelter. The cost of controlling injurious insects is reflected in the market. Also the consumer is frequently confronted with a price rise due to crop shortages caused by the inroads of destructive insects.

In addition to monetary loss, the establishment in this country of a foreign pest, such as the Mediterranean fruitfly, could so disturb the normal production and marketing of fruit as to cause serious losses to a number of related industries, particularly those engaged in the transportation, refrigeration, and canning or preserving of fresh fruits and vegetables. Moreover, the nuisance value of pests such as the Japanese beetle, is often very high. The production of agricultural crops is already sufficiently hazardous to warrant taking every precaution to prevent the further complications that would result from the introduction of additional crop pests. Farmers and fruit growers would probably favor the enforcement of effective quarantines for this reason alone even if no economic advantages could be expected.

Cost of Quarantine Enforcement

We have thus far been discussing the effect on the American public of the lack of quarantine safeguards which, in earlier years, permitted this country to become infested with many costly and destructive insects of froeign origin. Let us consider the cost to the

American people of the Government's quarantine program to safeguard against further inroads of foreign plant pests. The current annual appropriation of around two million dollars from Federal funds for foreign plant quarantine enforcement has already been mentioned. We have then to consider the prohibitory quarantines which forbid completely the importation from certain foreign countries of some plants and plant products such as wheat, citrus fruits, potatoes, sugar cane, yams, banana plants, bamboo plants, citrus nursery stock, seed rice, cottonseed, and certain other fruits and vegetables, mostly of tropical origin. Because of the risk of introducing serious plant pests, these products are withheld from the American market. Being thus freed from some foreign competition, these and closely related products of domestic production could reach a slightly higher price level in the United States. However, not all foreign countries are covered in each of the prohibitory quarantines. For instance, wheat may not be imported from the Orient, Australia, South Africa, Spain, or Italy, but it can move in freely from Canada, Mexico, and the South American countries. Somewhat similar features apply to potatoes and other products on the prohibited list. Hence, the over-all price increase of these and related products on the American market due to this limited restriction of foreign competition is of minor significance.

Except for the prohibited items mentioned above, practically all other importations of plants and plant products in the natural or unprocessed state are subject only to certain safeguard measures as a condition of entry into the United States. These vary considerably with the type of product and the pests encountered thereon. One safeguard applied to all importations is an inspection for pests upon arrival at the port of entry. Another is a requirement that nursery stock and other plant propagative material be inspected and certified as to apparent freedom from pests at origin by officials of those countries maintaining an inspection service. Still others involve treatment of the imported material when necessary to free it from infestations, sometimes at origin, sometimes en route, but mostly upon arrival at the port of entry in the United States.

The treatments prescribed likewise vary with the type of pests encountered. They include fumigation with various gasses under both reduced and normal atmospheric pressure, hotwater dips, quick freezing, vapor-heat treatments, and low temperature treatments. For instance, practically all importations of plant propagative material are subjected to fumigation with methyl bromide as a condition of entry. Vapor-heat or low-temperature treatments are required for certain fruits from some foreign countries. Railway cars from Mexico, fouled with cottonseed or other objectionable agricultural material, are fumigated with hydrocyanic acid gas at the time they cross the border into the United States.

These and other safeguard treatments, necessary to prevent the entry of destructive foreign pests, all add, in varying amounts, to the cost of the products imported, which is eventually paid by the consumer in this country.

To a limited extent, we are denied the privilege of enjoying the beauty or oddity of certain extoic flowers or ornamental plants, or of eating some unusual fruits, principally those of tropical origin, because of the enforcement of foreign quarantines. It should be stated, however, that such instances are exceedingly limited. There are provisions in the regulations by which the Department of Agriculture or its cooperating agencies may import prohibited plant material to be grown under strict quarantine surveillance and under adequate safeguards for the purpose of making new hybrids or otherwise prohibited species and varieties of ornamentals and food or fibre crops available for propagation and subsequent distribution in this country.

Quarantine Policies

Every effort is made to limit the restrictions on the free flow of imports to those which are absolutely necessary to safeguard such imports from the further introduction of destructive foreign pests. One of the guiding policies of the Department's quarantine program is to avoid the promulgation of a quarantine measure unless the value of the protection to be derived outweighs the economic loss which would be incurred by its enforcement. This policy likewise governs the continuance of existing regulations.

Another fundamental aspect of quarantine administration is the increasing recognition given to the principle that a prohibitory quarantine carries with it an obligation to explore every reasonable means by which the products thus excluded might be safeguarded by disinfection or some form of treatment that will eliminate the pest hazard, and thus allow the resumption of importations with safety. Because of the research and regulatory activities of the Bureau of Entomology and Plant Quarantine are closely integrated, the development of suitable safeguard treatments can be done for the benefit of the public and importers alike.

Summary

In summarzing the effect on the American public of the enforcement of foreign plant quarantine restrictions, it is freely admitted that such restrictions do place some burden on certain food and fibre crop imports which is probably reflected in higher prices paid by American consumers of these commodities. To a limited extent, also, some people are deprived of the enjoyment of certain tropical fruits or vegetables to which they or their parents may have been accustomed in their native land. Likewise, they may be denied some exotic plants, trees or shrubs of foreign origin, the entry of which cannot be safeguarded from certain destructive insect pests known to occur in their native home.

However, when one compares the cost of these restrictions with the millions of dollars alien insect pests now cost the American people every year to control, there can be little doubt that the best interests of the public are being served by the program of plant quarantine protection against the further inroads of destructive foreign pests. Unfortunately, the magnitude and the complexity of the struggle being waged at our ports of entry by a mere handful of technically trained quarantine inspectors is little known to the American public. Many new pests, seeking admission through every conceivable avenue of entry, are being turned back daily at our seaports, our airports and along our borders.

Rotating garden locations helps to reduce disease troubles.

VARIATIONS IN STEM PITTING ON TRISTEZA-INOCULATED PLANTS OF DIFFERENT CITRUS GROUPS

(Continued from page 7)

places. At the same time the recognition of mild tristeza virus strains (4) and the indicated variations in hybrid plant responses make comparisons difficult and point to the need for some limited exchange of comparable citrus seed lots in cases where distinct differences in reactions are reported.[1]

SUMMARY

Careful examination of 3,543 citrus seedlings, scions, and rootstocks (parts or all of tristeza-inoculated plants) has been made in the field nursery and screenhouse tests at Campinas, Brazil. The presence and degree of pitting were recorded on a numerical basis. The data obtained are summarized briefly in table 1, which gives the percentage frequency distribution according to the degree of pitting observed by citrus groups.

Among the citrus groups considered to be tolerant and desirable as rootstocks for sweet orange, the mandarin varieties observed had no pits or very few. In the sweet orange group there appeared to be distinct differences in varietal reactions. Florida Sweet Seedling orange had appreciably more pitting than the Valencia or the Bahianinha navel orange. Pitting of the sweet orange varieties as tops was most noticeable when they were grown on tolerant rootstocks and when no other tristeza symptoms were evident.

Although there may be some varietal differences the grapefruit appears to have tissues which tend to show pitting whether employed as a top, a rootstock or a seedling. Tangelos had less pitting than the grapefruit group but slightly more than the mandarin group.

(Continued on page 18)

Table 1.—Results of examination of tristeza-inoculated plants in nursery and screenhouse tests at Campias, Brazil, for degrees of pitting, by citrus groups.

Citrus group (1)	No. of tops	No. of roots	Percent frequency distribution of degrees of pitting (2)					
			0	1	2	3	4	5
Mandarin	300	167	98	2	0	0	0	0
Sweet orange	1252	57	75	17	5	2	1	0
Grapefruit	588	110	21	28	22	21	7	1
Pummelo	40	127	57	11	13	11	4	4
Tangelo	122	146	95	4	0.7	0.3	0	0
Trifoliate orange	20	——	100	0	0	0	0	0
Citrumelo	15	28	100	0	0	0	0	0
Citrangequat	13	——	84	8	0	8	0	0
Citrange	24	14	55	8	3	18	11	5
Eureka lemon	163	——	98	2	0	0	0	0
Seedling lemon (7 varieties)	34	——	91	6	0	0	3	0
Kula lemon (seedlings)	20 (3)	——	0	10	25	30	20	15
West Indian lime (4 varieties)	93 (3)	——	9	5	3	21	37	25
Sour orange	65	145	99	0.5	0	0	0	0.5
	2749	794						

(1) Material includes stem and roots pieces from seedlings, rootstocks with various tops, and tops on various rootstocks.
(2) Degree of pitting: 0, no pits; 1, very few scattered pits; 2, 3, 4, 5, increases in frequency of pits from few to many.
(3) Observations made on roots as well as tops.

The LYONIZER

Department

COMPILED BY THE LYONS FERTILIZER COMPANY

Reports Of Our Field Men . . .

SOUTHWEST FLORIDA
Eaves Allison

November's early cold spell gave all citrus of early and midseason varieties in this area a good color break. However, there seems to be no corresponding increase in the edibility, generally speaking It is a little too green to be good eating. It will take a while longer on the tree to give it that superior eating quality which we so proudly claim for Florida fruit. It looks good though to see some yellow fruit on the trees.

Vegetables are doing well since their recovery from the heavy rains of the early Fall. Tomatoes and cukes are moving and at this time, Nov. 14, the market is high. Some squash from the Immokolee area is going to market and the quality is good. Some 'burn' from the recent cold winds is observed on pole beans, cukes and squash.

Bulb plantings look very good and acreage in this section is about as usual.

PASCO AND EAST HILLSBOROUGH COUNTIES
E. A. McCartney

We have had considerable rain recently which was very badly needed. This will help the sizes of the fruit, although the benefit in that respect may be retarded due to cold weather. There seems to be considerable uncertainty as to prices getting any better.

We have been fertilizing the groves in this section in most cases earlier than usual which will tend to harden any new growth before the usual damaging weather arrives. Although we get early freezes occasionally, it is not until late December, January and some time in February that the damaging cold weather arrives.

There is considerable scale damage in some sections where growers had hoped to get by without an oil spray during the past summer. This is more noticeable on young orange trees.

PINELLAS COUNTY
T. D. Watson

With cooler weather in sight some fruit has begun to break color very rapidly. Generally speaking it has been very dry with an unusual amount of wind that hastens drying out of the soil. The rain that we had over the weekend was very welcome to all citrus growers. It will eliminate any irrigation for quite a long time.

As everyone knows the early crop of fruit is moving very slowly but with hopes of picking up in volume with cooler weather in prospect.

About one half of my growers have applied their fall application of fertilizer and are waiting to see what the market brings forth.

NORTH CENTRAL FLORIDA
V. E. Bourland

Weather has been dry. Quite a large amount of fruit has dropped as a result, but a number of groves have been irrigated. Since the cool weather has made a decided change in color, and more is passing the test, the fruit men are picking pretty regularly, but the prices have not been satisfactory.

Most all groves have been worked and are looking very good. The rain we started getting recently and are still getting are very much appreciated by the growers.

Cucumbers are about over. We had the best fall yield in a number of years, but the last week or ten days the price dropped, and picking has been stopped. Quite a large amount of cabbage is being set.

POLK, HIGHLANDS & HARDEE COUNTIES
By J. T. Griffiths and J. K. Enzor, Jr.

Excellent rains fell in Polk county on November 15 and 16. As much as 7 inches was recorded in some areas. This came at a time when a few growers had laid pipe and were beginning to irrigate. The cold spells during November have colored the fruit nicely, and even Valencias are beginning to break cover.

The peculiar blemish on Grapefruit last month is still present, but the condition has not been exaggerated during the past month. This blemish has resulted in rendering some Grapefruit crops un-marketable so far as fresh fruit is concerned. No good reason for its cause has been determined.

Red scale continues to be a problem in some groves, but Parathion sprays have generally been satisfactory in controlling this pest in the past six weeks. Purple mites are building up in many groves and DN is being applied by some growers.

Most growers will have completed their fall applications by the end of November.

SOUTH POLK, HIGHLANDS, HARDEE AND DE SOTO COUNTIES
C. R. Wingfield

Over the weekend of Nov. 16 to 20 we experienced a varied weather condition. Just prior to this time some of the growers had begun irrigation and temperatures were high. We had rains ranging from two to three inches and this was followed by cold winds and a sudden drop in temperature to the middle thirties, with lower figures in lowland areas. There was frost on Monday and Tuesday mornings. Tender vegetables were damaged from cold winds and low temperatures. No damage has been found in citrus.

Growers have been busy with their fall fertilizer application and it is interesting to note that they are applying a well balanced mixture in spite of the low prices of fruit. A good range of secondaries are being included in the fertilizer. We should not refer to these elements as secondary for they are of major importance in growing quality fruit.

WEST CENTRAL FLORIDA
J. E. Mickler

This has been a busy month for members of the citrus industry what with some selling of fruit, picking and getting the fall application of fertilizer put out. There has been a little cold weather and a good rain fall in Hernando county gladdened the hearts of all. Heavy rain caused some wash of grove land in Hernando county, but the overall good mitigated this bad feature.

Pasture owners suffered this month from an invasion of Army Worms in a few sections. To those that have not fertilized pastures, now would be a speindid time to get the root system in good shape for next spring.

Melon growers are busy in preparation of soil and some growers plan an early application of fertilizer to get an early start. More are taking the edge off the gamble in melons by sinking wells.

Uncle Bill Says:

Florida's Citrus Industry over the years has had many problems to contend with includin' disorganization in the industry, hurricanes, freezes, bank failures, pests, floods and drouths . . . but throughout all that time the growers has managed to come out of these and other difficulties and always managed to land on their feet.

And the fellers who has landed most firmly is the ones who has stuck consistently to the policy of producin' the most palatable fruit that could be raised and kept their groves in the best possible shape at all times and under all conditions, so as to insure big crops and keep their trees in the best possible shape to ward off pest infestations and to resist cold weather and other things that the climate sometimes sets up as a hazard.

There ain't no denyin' that there are seasons when various things affect the price of our crops . . . but in the final analysis when the millions of folks who consume millions of boxes of fruit find that fruit good to the taste, the juice sweet and palatable our crops are a lot easier to sell than when the fruit don't taste sweet and good.

Texas and California is havin' trouble . . . a heap of trouble . . . many of Texas once finest groves has been pulled up by the roots and cotton and other crops has been planted in their place . . . one Texas packin' house man told us the other day that his state wasn't goin' to ship more than one-sixth the amount of fruit this year that they did a year ago . . . and California is havin' trouble with sizes and tree disease, so even if Florida's crop is growin' bigger every year increased consumption and troubles in other citrus growin' areas shouldn't hurt us too much if we make sure that we're raisin' and marketin' the finest fruit it's possible to produce.

So we suggest that we don't pay too much attention to the calamity talk, if they is any, and continue to stick to the job of raisin' big crops right on of the finest citrus fruit it's possible to produce.

. . . And, personally, we don't know of any better way to do that job than to fertilize with Lyons Fertilizers . . . a fact that a heap of Florida growers has already learned through actual experience.

VARIATIONS IN STEM PITTING ON TRISTEAZ-INOCULATED PLANTS ON DIFFERENT CITRUS GROUPS

(Continued from page 15)

The results of examination of the pummelo, trifoliate hybrid, lemon, and lime groups strongly suggest that minor differences in hybrid plant reactions can have an important effect on the presence and degree of pitting.

Tristeza-inoculated plants of the sour orange group would seem to have no or very little tendency to show pitting.

1—Costa, A. S., Grant, T. J., and Moreira, S. Investigacoes sobre a tristeza dos citrus. II. Conceitos e dados sobre a reacao das plantas citricas a tristeza. Bragantia 9: 59-80. 1949.

2—Costa, A. S., Grant, T. J. and Moreira, S. A possible relationship between tristeza and the stem pitting disease of grapefruit in Africa. Calif. Citrog. 35 (12): 504, 526-528. 1950.

3—Grant, T. J., Costa, A. S., and Moreira, S. Studies of tristeza disease of citrus in Brazil. III. Further results on the behavior of citrus varieties as rootstocks, scions and seedlings when inoculated with tristeza virus. Proc. Fla. State Hort. Soc. (1949). 62: 72-79. 1950.

4—Grant, T. J., and Costa, A. S. A mild strain of the tristeza virus of citrus. Phytopath. 41: 114-122. 1951.

5—Grant, T. J., Costa, A. S., and Moreira, S. Studies of tristeza disease of citrus in Brazil. V. Further information on the reactions of grapefruits, limes, lemons, and trifoliate hybrids to tristeza. Calif. Citrog. 36 (8) 310, 311, 324-326, 328, 329. 1951.

6—McClean, A. P. D. Virus infections of citrus in South Africa. Farming in South Africa. 25: (293) 262, 25: (294) 289. 1950.

7—Oberholzer, P. C. J., Mathews, I., and Stimie, S. F. The decline of grapefruit trees in South Africa. A preliminary report on the so-called stem pitting. Union of South Africa Sci. Bull. 297. (1949).

8—Wallace, J. M., and Drake, R. J. Newly discovered symptoms of quick-decline and related diseases. Citrus Leaves. 31: (2) 8, 9, 30, 1951.

9—Knorr, L. G., E. P. Ducharme and A. Banfi. The occurrence and effects of "stem pitting" in Argentina grapefruit groves. Citrus Magazine 13: (14), 32-36, 1951.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC. REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946, OF THE CITRUS INDUSTRY, PUBLISHED MONTHLY AT BARTOW, FLORIDA, FOR OCTOBER, 1951.

STATE OF FLORIDA,
COUNTY OF POLK.

Before me, a notary public in and for the State and county aforesaid, personally appeared S. Lloyd Frisbie, who having been duly sworn according to law, deposes and says that he is the Business Manager of The Citrus Industry and that the following is to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, as amended by the Act of March, 1933, embodied in Section 537, Postal Laws and Regulations, printed on the reverse side of this form, to-wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are:

Publisher — Associated Publications Corp., Bartow, Fla.

Editor — S. L. Frisbie, Bartow, Fla.

2. That the owners are:

Associated Publications Corporation, Bartow, Florida.

S. L. Frisbie, Bartow, Fla.
S. Lloyd Frisbie, Bartow, Fla.
Loyal Frisbie, Bartow, Fla.
Richard R. Frisbie, Bartow, Fla.
B. L. Gable, New York, N. Y.
F. L. Skelly, Orlando, Fla.
B. W. Skinner, Dunedin, Fla.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are:

Mosel Preston, Auburndale, Fla.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholders or security holder appears upon the books of the company as trustee or in any other fiducary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold than that of a bona fida owner.

S. LLOYD FRISBIE
Business Manager

Sworn to and subscribed before me this 1st day of October, 1951

CLYDE GIBSON, Notary Public
My commission expires Jan. 14, 1952.

THE PROGRAM OF CERTIFICATION OF CITRUS BUDWOOD

(Continued from Page 9)

through experience that the nurseryman cannot do the job alone. In both states a demand has been created for these disease-free trees by an educational program sponsored by those concerned with the welfare of the citrus industry. Without such an educational program this program can fail.

Today no one is to blame for the number of infested trees in a grove because at the time these trees were propagated no one knew about the virus nature of psorosis or its transmission through infested buds. Tomorrow ignorance will be no excuse as a method of prevention is well known. Present Florida laws are designed to protect the people of Florida from misrepresentation and plant material infested with dangerous insect pests, and diseases. At present the sale of plants with some minor insects or scale may be topped, but citrus nursery trees with psorosis, a deadly virus disease, may be sold. The sale of such psorosis infested trees should be stopped. Only you, the nurseryman, the foundation of the largest citrus industry in the world, and you, the grower, the backbone of this great citrus industry, can change this by starting a citrus registration program today.

Availability of elements such as copper, zinc, boron and manganese is lower for most crops when the soil has a high pH level, according to the Florida Agricultural Experiment Station.

Classified Ads

Fifth Annual Youth Fair At Bartow...

More than 750 youths will get the chance to display their exhibits in the fifth annual Polk County Youth Fair to be held in Bartow, Dec. 5, 6, 7, and 8.

The fair, according to Grover Howell, Coordinator of Vocational Guidance in Polk County, is the biggest in Florida and is rapidly developing into the biggest rural youth event in the nation.

All events will center around the new Livestock and Crops pavilion and prizes will be awarded for everything from bee-keeping to dairy cattle.

RICKBORN AND LOGAN JOIN IN POLK COUNTY GROVE ENTERPRISE

J. H. Rickborn has purchased one-half interest in the grove management business of Clayton Logan, Inc., and the organization name has been changed to Logan and Rickborn, Inc.

Rickborn has been work.ng actively with the organization since September. He has been a long time resident of Lakeland. His home address is 205 East Belvedere Street.

Until becoming associated with this organization, Rickborn was Sales Manager for the Lyons Fertilizer Company of Tampa. He has been actively engaged in citrus and vegetable production throughout the state during the past twenty years.

Born in St. George, South Carolina, Rickborn is a graduate of Clemson University and holds a master's degree in agriculture from Iowa State University.

YOU GET YOUR FULL MONEY'S WORTH...

When you buy and use Lyons Fertilizers . . . not only for the reason that only the very finest ingredients go into the manufacture of our fertilizers . . . but because years of intensive study have enabled us to recommend the particular fertilizer best suited to each individual grower's requirements . . . the rapid growth of our business attests the merit of these factors so important in the fertilizers which bear the Lyons name.

For Maximum Crops of Finest Quality

Use Lyons Fertilizers

9/ 23237 1-12

Lyons Fertilizer Company

Tampa, Florida

AGENTS CARRYING STOCK:

John W. Barber, Jr., Webster
Walker's Grocery Co., Wauchula
Norman Blocker, Blanton
N. C. Beckett Grove Service,
Winter Garden
Dowling Feed Store,
715 9th St., Bradenton
Fox Feed Store,
413 W. Waters Ave., Tampa
W. B. Goding & Son, Apopka
Farmers Supply Co., Immokalee
Harry Goldberg, Pompano
Raymond Graham, Zolfo Springs
Hillsboro Feed & Milling Co.,
3021 E. Broadway, Tampa
Harold H. Kastner & Co.,
1300 French Ave., Sanford
Kilgore Hardware-Auto Parts Inc.,
5002 E. Broadway, Tampa
A. G. Maccaulay
1039 Central Ave., St. Petersburg
McCord Feed Store, Winter Garden
Judson Nichols, Pierson
John W. Parker, Arcadia
Sarasota Feed Co.,
9th and Lemon, Sarasota
A. H. Schrader, San Antonio
Slaughter & Taylor, Inc.,
8th Ave., Palmetto
South Bay Growers, Inc., South Bay
J. C. Smith & Son, Lakeland
Taylor's Feed Store, Zephyrhills
Tampa Feed Co., 5904 Florida Ave.,
Tarpon Feed & Supply Co.,
Tarpon Springs
Thornton Feed Co.,
8718 Nebraska Ave., Tampa
Unity Farms, Inc., Pahokee
G. E. Wetherington,
Route 2, Box 479, Plant City
Wells Citrus Service & Supply Co.
Tavares

LYONIZE YOUR CROPS

FIELD REPRESENTATIVES:

V. E. Bourland, Winter Garden
E. A. McCartney, Temple Terrace, Tampa
Dr. J. T. Griffiths, Winter Haven
Joe K. Enzor, Jr., Winter Haven
Eaves Allison, Sarasota
J. E. Mickler, Inverness
C. R. Wingfield, Avon Park
Norman Tuckett, Minneola
Tillman D. Watson, Tampa

LYONIZE YOUR CROPS